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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is also included. (AG)

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TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

COIL ASSEMBLER (elec. equip.; electronics) I 6-99.161

B-435 or B-169

TM 001 100

U. S. Employment Service in
Cooperation with
Wisconsin State Employment Service

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
January 1960

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GATB #2236
August 1959

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR COIL ASSEMBLER I 6-99.161

B-435 or S-169

Summary

The General Aptitude Test Battery, B-1002A, was administered to a total sample of 53 women employed as Coil Assembler I 6-99.161. Forty-five were employed at Industrial Coils, Incorporated and eight at the Hagen Manufacturing Company in Baraboo, Wisconsin. The criterion consisted of combined supervisory ratings based on a descriptive rating scale. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes S-Spatial Aptitude, Q-Clerical Perception, and F-Finger Dexterity were selected for inclusion in the test norms.

GATB Norms for Coil Assembler I 6-99.161 – B-435 or S-169

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Coil Assembler I 6-99.161.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-435 or S-169

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
S	CB-1-F CB-1-H	85	S	Part 3	80
Q	CB-1-B	90	Q	Part 1	90
F	CB-1-O CB-1-P	85	F	Part 11 Part 12	80

Effectiveness of Norms

The data in Table V indicate that 13 of the 18 poor workers, or 72 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 72 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 26 of the 31 workers who made qualifying test scores, or 84 percent, were good workers.

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TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Coil Assembler I 6-99.161.

II. Sample

The GATB, B-1002A, was administered to a total sample of 53 women employed as Coil Assembler I 6-99.161. Forty-five women were employed at Industrial Coils, Incorporated in Baraboo, Wisconsin and tested August 25 and 26, and October 31, 1958. Eight were employed at Hagen Manufacturing Company, Baraboo in Wisconsin and tested June 10, 1959. Since workers at both companies performed the same job duties and both companies had essentially the same selection procedures and performance standards, the 45 women employed at Industrial Coils, Incorporated and the eight at Hagen Manufacturing Company were considered to be sufficiently comparable for inclusion in the same experimental sample. There were no minimum age or experience requirements. One month is usually required for a worker to reach average production. All workers in this sample had at least two months of experience. The requirement of an eighth grade education was not always adhered to in a tight labor market. The selection of applicants was made on the basis of a personal interview and a check of references.

Table II shows the means, standard deviations, ranges, and Pearson product-moment correlations with the criterion for age, education, and experience.

TABLE II

Means (M), Standard Deviations (σ), Ranges and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

Coil Assembler I 6-99.161
N = 53

	M	σ	Range	r
Age (years)	36.7	9.8	20-59	-.174
Education (years	10.0	2.0	6-14	.278*
Experience (months)	61.9	30.8	2-108	.130

* Significant at the .05 level

There are no significant correlations between age or experience and the criterion. The correlation between education and the criterion is significant at the .05 level but is not very great in magnitude. Thus, the correlation may indicate either that the raters had a slight bias in favor of those workers with more education or that there was a tendency for those workers with more education to perform better on the job.

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III. Job Description

Job Title: Coil Assembler I 6-99.161

Job Summary: Assembles ½" to 14" electric coils for use in radio equipment, cigarette machines, brake clutches, etc., using various hand tools such as soldering iron, knife, and pliers.

Work Performed: Rubs lead wires of coil between fine sandpaper to clean prior to soldering. Inserts lead wires coated with enamel insulation in rush wire stripper machine to remove coating prior to soldering operation. Places coil on assembly jig. Pulls lead wires to one side and anchors with gum tape to insulate wires against shorts. Wraps gum tape, paper or glass cloth strips around coil depending on the type of coil for insulation and/or anchor terminal mounting. Threads lead wires through notches of terminal mounting and around terminal lugs or wires. Solders lead wires to terminal mounting or wire using soldering iron or by dipping ends in solder dip pot. Cuts excess lead wire to soldered joint using knife or pliers. Removes finished coil from jig. Presses terminal ends against metal plates of voltmeter to check for open circuit. Positions acetate flanges on open end of coil and places in small bench press under 150° heat to set acetate to the coil. Inspects coils and materials and notifies foreman of any defects. Maintains production records. Removes coils from press and stacks in box.

IV. Experimental Battery

All the tests of the GATB, B-1002A, were administered to the sample group.

V. Criterion

The criterion consisted of supervisory ratings on an adaptation of the Descriptive Rating Scale developed by the Bureau of Employment Security, Form SP-21. The first line supervisor prepared ratings and reratings for each worker with a time interval of three to five weeks between the first and second ratings. The rating scale consisted of nine items, each covering an important aspect of the duties. Each item had five statements regarding the degree of adequacy of performance. Weights of one through five indicating the degree of job performance attained were assigned to each alternative -- "1" indicating poor performance and "5" indicating excellent performance. The score on the scale for each rating is equal to the sum of the numbers checked for all nine items. A correlation coefficient of .84 was obtained between the two sets of ratings. This indicated a satisfactory degree of reliability. The final criterion score consisted of the combined rating scale scores. The possible range of combined scores was 18 through 90. The actual range was 40 through 79 with a mean score of 70.0 and a standard deviation of 7.8

VI. Qualitative and Quantitative Analyses

A. Qualitative Analysis:

The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation.

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Form Perception (P) - required to inspect materials and coils for defects.

Motor Coordination (K) and Finger Dexterity (F) - required to wrap gum tape, paper or glass cloth strips around the coil; to thread lead wires through notches of terminal mounting and around terminal lugs or wires; and to solder lead wires to terminal mounting.

Manual Dexterity (M) - required to cut excess lead wire, using a knife or pliers; to place coils on the assembly jig; and to remove finished coils from the jig.

On the basis of the job analysis data, Aptitude V is considered obviously unimportant for performing the duties of this job and is considered an "irrelevant" aptitude.

B. Quantitative Analysis:

Table III shows the means, standard deviations, and Pearson product-moment correlations with the criterion for the aptitudes of the GATB. The means and standard deviations of the aptitudes are comparable to general working population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

Coil Assembler I 6-99.161
N = 53

Aptitudes	M	σ	r
G-Intelligence	96.1	15.1	.244
V-Verbal Aptitude	98.1	15.4	.146
N-Numerical Aptitude	97.1	15.1	.133
S-Spatial Aptitude	94.1	16.4	.355**
P-Form Perception	101.2	15.4	.313*
Q-Clerical Perception	101.5	14.5	.270
K-Motor Coordination	99.5	15.6	.066
F-Finger Dexterity	99.0	18.2	.394**
M-Manual Dexterity	100.9	19.1	.221

**Significant at the .01 level
*Significant at the .05 level

Aptitudes P, Q, and M have the highest mean scores and Aptitude Q has the lowest standard deviation.

For a sample of 53 cases, correlations of .351 and .271 are significant at the .01 level and the .05 level of confidence, respectively. Aptitudes S and F correlate significantly with the criterion at the .01 level. Aptitude P correlates significantly with the criterion at the .05 level.

C. Selection of Test Norms

TABLE IV

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important					X		X	X	X
Irrelevant		X							
Relatively High Mean					X	X			X
Relatively Low Sigma						X			
Significant Correlation with Criterion				X	X			X	
Aptitudes to be considered for trial norms				X	X	X		X	X

Trial norms consisting of various combinations of Aptitudes S, P, Q, F, and M with appropriate cutting scores were evaluated against the criterion by means of the tetrachoric correlation technique. A comparison of the results showed that B-1002 norms consisting of S-80, Q-90, and F-80 had the best selective efficiency.

VII. Validity of Norms

The validity of the norms was determined by computing a tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test. The criterion was dichotomized by placing as close as possible to one-third of the sample in the low criterion group. A combined rating scale score of 63 was used as the criterion critical score and resulted in 18 of the 53 workers or 34 percent of the sample being placed in the low criterion group.

Table V shows the relationship between test norms consisting of Aptitudes S, Q, and F with critical scores of 80, 90, and 80 respectively, and the dichotomized criterion for Coil Assembler I 6-99.161. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE V

Validity of Test Norms S-80, Q-90, F-80
N = 53

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	9	26	35
Poor Workers	13	5	18
Total	22	31	53

$r_{tet} = .67$

$\sigma_{r_{tet}} = .22$

$X^2 = 8.761$

$P/2 < .005$

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

VIII. Conclusions

On the basis of the results of this study, Aptitudes S, Q, and F with minimum scores of 80, 90 and 80 respectively have been established as B-1002 norms for the occupation of Coil Assembler I 6-99.161. The equivalent B-1001 norms consist of S-85, Q-90, and F-85.

IX. Determination of Occupational Aptitude Pattern

The specific norms established for this study did not meet the requirements for allocation to any of the existing 23 occupational aptitude patterns. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.